भारत हेवी इलेक्ट्रिकल्स लिमिटेड
(भारत सरकार का उपक्रम)
BHARAT HEAVY ELECTRICALS LIMITED
(A Govt. of India Undertaking)

TCN - 01

Ref: PSER:SCT: SDG-M1268:TCN-01 Date: 10-11-2011

Sub	Tender change notice (TCN) 01.	
Job	Design, engineering, manufacturing, supply, erection, Testing, commissioning etc including O&M of two nos. 110/25 T Capacity DOUBLE GIRDER TG hall EOT Crane for 2x500 MW units at Sagardighi STPP, Sagardighi, West Bengal.	
Ref	1.0	PSER:SCT:SDG-M1268:11
	2.0	BHEL's NIT, vide reference no PSER:SCT:SDG-M1268:2574, dated 31-10-2011.
	5.0	All other pertinent issues till date.

With reference to above, following points/ documents, relevant to tender, may please be noted and complied with while submitting offer.

1.0 'Project Specific Technical Specification' as per enclosed specification no PE-TS-373-501-A-001, Rev-00, along with Amendment no 1
2.0 Bidders to note that there is no lifting beam requirement. Please refer crane clearance diagram provided in the 'Project Specific Technical Specification' as referred in sl no 1.0 above.
3.0 'Colour Coding Procedure/ Scheme' included as per enclosed Annexure-IV.
4.0 Revised `No deviation certificate' as per enclosed Annexure-2. Bidder shall submit no deviation certificate as per enclosed format only.
5.0 All other terms & conditions shall remain unchanged.

Thanking you,

Yours faithfully,
for BHARAT HYEAVY ELECTRICALS LTD

ENGR(SCT)

Encl
1.0 As above.

पावर सेक्टर पूर्वी क्षेत्र (मुख्यालय)
POWER SECTOR EASTERN REGION, DJ-9/1, SECTOR-II, SALT LAKE CITY, KOLKATA - 700 091
फैक्स/Fax : (033) 23211960 फोन/Phone : बोर्ड/EPABX : 23211691, 23211798, 23211796

Project Specific Technical Specification

TG HALL CRANE.

SPECIFICATION NO.: PE-TS-373-501-A-001

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR PROJECT ENGINEERIING MANAGEMENT
NEW DELHI
INDIA

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Note:

1.0 The standard technical specification PE-TS-STD-501-A-001 Rev 03 is also be applicable for this project.

2.0 Project Specific data Sheet and Customer specific requirements given in project specific technical specification should be complied with.

3.0 In case of any deviation, bidder to specify the same in deviation format, deviation submitted elsewhere will not be considered for evaluation.

4.0 In case of any conflict between Customer specific requirement(Annexure-III), standard specification & Project specific technical data sheet, then the more stringent requirement as per the interpretation of the owner shall be comply.

Annexure-I

VENDOR HAS TO SUBMIT ONLY FOLLOWOING DOCUMENTS ALONG WITH THE OFFER, FOR TECHNICAL EVALUATION OF THE BID:-

1.0 Specific confirmation / Comments from the bidder as per BHEL Format.

2.0 'NO DEVIATION CERTIFICATE' – Clearly mentioning that bidder has considered 'No - Deviation' from the technical specification provided by BHEL.

OR

DEVIATION Sheet, indicating clause wise technical deviation if any.

3.0 Un-price format, duly mentioned 'Quoted' against each Sl. no. below Each column.

Note1:- Any other standard document/ details furnished by the bidder i.e. Data sheet / Crane clearance diagram/ GA Drawing/ QAP etc. shall not be taken in to consideration for evaluation.

Note 2:- Bidder to note that if bidder does not submit the document mentioned in Sl. No. 1.0 , 2.0, and 3.0 along with their offer then their offer is liable to be rejected.

PROJECT INFORMATION

DCPL-K8A07

VOLUME : IIA

SECTION-III

PROJECT SYNOPSIS AND GENERAL INFORMATION

1.00.00 INTRODUCTION

The proposed 2 x 500 MW Sub-c ritical Extension (Unit 3 & 4) Sagardighi Super Thermal Po wer Project would be set up by W est Bengal power Development Corporation Limited (WBPDCL) a t a site, which falls und er the villages Manigram in Murshidabad district of West Bengal, India.

The Bidder shall acqu aint himself b y a visit to the site, if fe lt necessary, with the conditions prevailing at site before submission of the b id. The information given here in under is for general guidance a nd shall not be contractually binding on the Owner. All relevant site data/information as may be necessary shall have to be obtained / collected by the Bidder.

2.00.00 APPROACH TO SITE

Sagardighi Super Thermal Power Station site is located at Manigram village, 13 KM north of Sagardighi town by the side of the SMGR (Sagardighi-Manigram-Gankar-Raghunathganj) Road at a d istance 20 KM fro m National Highway 34 in Murshid abad District, West Ben gal and aro und 240 KM fro m Kolkata, India. The nearest rail stat ion is Manigram adjacent to the site on Bandel - Barhawara branch line and 6.5 KM from Sagardighi Railway Station on S ainthia - A zimgunj l ine o f E astern R ailway. F rom Sagardighi railway station a railway line will branch off to the sit e for material unloading and coal marshalling. The eq uipment will be n ormally transported by rail only and under exceptional cases b y road. T he material consig nments s hall be as pe r the restrictions of rail and road transportation prevailing in the country.

Nearest Airport – Kolkata.

Nearest Seaport – Kolkata/ Haldia

3.00.00 LAND

The total land, approximately 706 hectares, has already been acquired for the present, proposed extension and fu ture combined cycle un its. The locati ons of various facilities and plant auxiliaries for Unit 1 & 2 under Phase-I and Units 3 & 4 for e xtension project with space provisi on for f uture combined cycle units will be as per the General Layout enclosed. About 456 acre of land has been kept for disposal of ash . T he Bid der shal l acco mmodate e quipment of fered under this speci fication generally wi thin the spac es allocated fo r such eq uipment in the General Layout. Specific approval from Owner/Consultant shall be taken by the contractor prior to any revision or relocation.

Except where stated otherwise, the plinth levels of all buildings shall be 300 mm above the corresponding developed grade level and the road level shall be 150 mm above the developed grade.

4.00.00 SOURCE OF COAL

The Power Station has been linked to Jhanjra, Chitra and Sarpi mines of Eastern Coal fields (ECL) and Panchwara & Damagoria for extension units.

Coal will be transported on broad-gauge line of Eastern Railways from the coal fields to the Power station in BOBRN rake loads.

Fuel oil (HF O/LDO) will normally be transported by railway oil tankers from nearest oil depot.

5.00.00 SOURCE OF WATER

The water requirement for the Power station will be met by drawing water from river Bhagirathi at a distance of 6 KM east of project site.

The Power station will operate on closed cooling system using Natural Draft Cooling Towers. In addition, all water conservation and recycling measures will be adopted to minimize requirement of make up water. The Bidder shall include in his proposal all such conservation measures adopted.

6.00.00 ASH DISPOSAL AREA

The ash disposal area for the station is located about 1 Km from the plant site.

The Site Location Plan will give an idea of the locations of the site, colony, ash disposal area and rail and road connections.

7.00.00 SALIENT CLIMATOLOGICAL AND DESIGN DATA

7.01.00 Unless otherwise specified, the following design conditions shall be considered for the equipment offered:

a)	Design ambient dry bulb temperature	:	50 ºC maximum, 5 ºC minimum
b)	Maximum relative humidity	:	84%
c)	Average relative humidity	:	73%
d)	Highest wet bulb temp.	:	26.9 ºC

	e)	Average annual rainfall	:	1389 MM
	f)	Seismic zone	:	Zone-III as per IS-1893 latest revision
	g)	Wind load	:	In accordance with IS-875 for a basic wind speed of 47 m/s ec upto a height of 10 metres above mean ground level. For further details refer Volume I I-G of this specification.
h)		Altitude	:	34M above MSL.

DCPL-K8A07

PAINTING SPECIFICATION

GENERAL

All exposed metallic surfaces subject to corrosion shall be protected by shop application of suitable coatings. Surfaces not easily accessible after shop assembly shall be treated before-hand and protected for life of the equipment. Surfaces to be finish painted after installation shall be shop painted with at least two(2) coats of primer. Steel surfaces, which are not to be painted, shall be coated with suitable rust preventive compound subject to the approval of the Owner.

All paints shall be used in accordance with the manufacturer's instructions. No thinners or other substance shall be added to the coating material without the approval of the Engineer. The quality and vendor of the paints shall require approval of the Owner.

All paints, when applied in a normal full coat, shall be free from runs, sags, wrinkles, patchiness, brush marks or other defects.

All primers shall be well marked into the surface, particularly in areas where pitting is evident, and the first priming coat shall be applied as soon as possible after cleaning, within four hours maximum. The paint shall be applied by brush, roller or airless spray, according to the manufacturer's instructions. Spray painting shall be carried out by operators trained and thoroughly experienced in the use of the equipment. If the drying interval between successive coats, which should not exceed one week, has been so long as to endanger the adhesion of the following coat, the paint already applied shall be lightly rubbed down with fine abrasive paper before putting on the next coat.

Paint spraying on large surfaces shall not normally be done indoors, except with the approval of the Engineer. Spray guns shall not be used out doors in windy weather or near unprotected surfaces of a contrasting colour and under no circumstances shall spray guns be used where spray may be carried into or onto exposed electrical equipment.

Paint containers shall not be opened until required and the paint shall be mechanically mixed thoroughly before use, and agitated occasionally during use.

Electrical equipment shall be shop finished with one or more coats of primer and two coats of high-grade oil resistant enamel. The interior of all panels' cabinets and enclosures shall be finished with gloss white enamel.

The Bidder shall furnish sufficient touch-up paint for one complete finish coat on all exterior factory surfaces of each item of equipment. The touch-up paint shall be of the same type and colour as the factory applied paint and shall be carefully packed to avoid damage during shipment. Complete painting instructions shall be furnished.

Shop primer for steel and iron surfaces which will have a continuous operating temperature below 35 Deg.C shall be selected by the Bidder, in accordance to the relevant standard. Special high temperature primer shall be used on surface exposed to operating temperature above 35 Deg.C.

The colour scheme shall be submitted during execution of contract for approval by the Purchaser/Engineer.

PREPARATION

Oil and grease shall be removed from the surface by washing with a suitable detergent, rinsing with clean water, and drying.

Surfaces to be shot blasted shall be cleaned to Swedish Standard SA 2.5 or equivalent, and all dust remaining after cleaning shall be removed.

The priming coat shall be applied without delay.

Damaged Paintwork

Any damaged paintwork shall be made good as follows :

a) The damaged area, together with an area extending 25mm around its boundary, shall be cleaned down to bare metal.

b) A priming coat shall be immediately applied, followed by a full paint finish equal to that originally applied and extending 50 mm around the perimeter of the original damage.

c) The repainted surface shall present a smooth surface. This shall be obtained by carefully chamfering the paint edges before and after priming.

PAINTING SYSTEM

The requirements for the dry film thickness (DFT) of paint and the materials to be used shall be as stated below, unless otherwise specified elsewhere in this specification.

a) Surfaces Subject To Weathering

All surfaces shall have a minimum of four coats of paint made up as follows :

Primer coat	:	35 micron DFT
Tie coat	:	35 micron DFT
Finishing coat (2 Nos.)	:	35 micron DFT per coat

The total minimum DFT shall be 140 micron.

b) Surfaces Inside Buildings

All surfaces shall have a minimum of three cqats of paint made up as follows:

Primer coat	:	35 micron DFT
Tie coat	:	35 micron DFT
Finishing coat (2 Nos.)	:	25 micron DFT per coat

The total minimum DFT shall be 120 micron.

The type and colour of primer & finish coats hall be selected by the Bidder after approval by the Owner.

COLOUR CO-ORDINATION & FINISH

Exterior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and with the surrounding landscape.

Interior surfaces throughout the plant shall be finished in colours and textures which will blend harmoniously together and which will be conducive to; the comfort, well-being and high productivity of the operators. Operating plant and services provided shall be colour coded for ease of identification.

All finishes shall be durable and as far as possible maintenance free. Finishes shall be easily cleaned.

Final colours and finishes shall be to the Approval of the Engineer.

PAINTING PROCEDURE / SCHEME

	ITEM DESCRIPTION	SURFACE PREP.	**PRIMER**	No. of Coats	MIN DFT µ	INTERMEDIATE	No. of Coats	FINISH	No. of Coats	MIN DFT µ	TOTAL DFT(Min.)
a	Piping / Structures / Vessels etc. (Temp. up to 90 Deg. C)	Degreasing and Mechanical Cleaning with wire brushing / hand Tool (SA1 / ST2 / ST3 as applicable)	Red Oxide Zinc Chromate as per IS: 2074 (alkyd medium)	1	35 per coat	35 per coat	1	Synthetic Enamel (alkyd Medium) as per IS : 2932	2	35 per coat	140
b	Electrical / Control Panels	Seven Tank Process	zinc phosphate (alkyd medium)	1	35 per coat	35 per coat	1	Synthetic Enamel (alkyd med.) as per IS: 2932	3	35 per coat	140
c.	Various type of equipment , valves etc. (Temp. upto 90 Deg. C)	Degreasing and surface preparation to SA 2 1/2	zinc phosphate (alkyd medium)	1	25-35 per coat	35 per coat	1	Synthetic Enamel (alkyd Medium) as per IS : 2932	3	35 per coat	140

COLOR CODING PROCEDURE / SCHEME

Sl.no.	ITEM DESCRIPTION	COLOUR SHADE	REMARKS
a	Crane structure	golden yellow, shade 356 as per IS-5	
B	Bottom block assembly	golden yellow, shade 356 as per IS-5	With black strip
C	Hooks	golden yellow, shade 356 as per IS-5	With 100 mm wide black zebra strip
d.	End carriage sweep	golden yellow, shade 356 as per IS-5	With black strip
e.	Panels and motors	light grey / as req. by purchaser	

Technical Data Sheet of EOT Crane

S.N.	Description	Technical Particulars	
2.0	**Number of crane/s**	Two (2) nos. 110/25 T.	
3.0	**Crane classification**	M5	
4.0	**Suitable for outdoor or indoor duty**	Indoor	
5.0	**Capacity**	110/25 T.	
5.1	**Main hoist**		
	Rated SWC – tones	110 T	
	Test load SWC – tones	overload test 137.5 T (125% of SWC)	
5.2	**Aux. hoists**		
	Rated SWC – tones	25 T	
	Test load SWC – tones	25T and overload test 31.250 T (125% of SWC)	
6.0	**Span**	32.40 M	
7.0	**Operation from**	Cabin + pendent push button+ Radio remote control	
8.0	**CRANE PERFORMANCE**		
8.1	Crane speed with full load	**Full speed M/Min**	**Creep speed M/Min**
	Main hoist	1.6	10% of main speed (thru' VVVF drives)
	Aux. Hoist	7.5.0	10% of main speed (thru' VVVF drives)
	Trolley travel (CT)	15.0	10% of main speed (thru' VVVF drives)
	Longitudinal bridge travel (LT)	30.0	10% of main speed (thru' VVVF drives)
8.2	**Lift in Meters**		

	Main Hoist	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
	Aux Hoist	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
8.3	**Hook Approaches**		
	Main hook (cabin end)	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
	Aux. Hook (cabin-end)	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
	Main hook (other end)	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
	Aux. Hook (other end)	(Refer Crane Clearance Diagram no. PE-DG- 373-501-A001 Rev 00)	
9.0	**COMPONENT DETAILS**		
9.1	**Trolley**		
	Type	Fabricated	
	Method of fabrication	Fusion welded	
	Material conforming to IS:	IS: 2062 Gr. A or B	
9.2	**Rope drums**	**Main hoist**	**Aux. Hoist**
	Material (Indicate IS)	Seamless pipe ASTM -106 or fabricated Fe410w IS: 2062 & stress relieved	
	Numbers provided	One for each hoist	
	Type of grooves	Identical Right hand and Left hand	
	Flange /Flangeless	Flanged	
9.3	**Rope details**		
	Standard	IS:2266	
	Construction	Extra flexible plough steel / 6 x 36 / 6 x 37 construction	
	Factor of safety	5.25 as per IS	5.25 as per IS
	Type of core	Fibre	Fibre
9.4	**Sheaves details**	**Main hoist**	**Aux. Hoist**

	Material	Fe 410 WA IS: 2062 Gr. A or B / CS Gr. 280-520 IS: 1030			
	Diameter of Equivalent sheaves in mm on Root	Should not be less than 62% of calculated main sheave diameter.	Should not be less than 62% of calculated main sheave diameter.		
	Type of guards provided	Fabricated from Sheet steel			
9.5	**Coupling & Shafting**				
9.5.1	**Coupling details (between motor and gear box)**	**Main Hoist**	**Aux. Hoist**	**Cross Travel**	**Long Travel**
	Type	Flexible geared type			
	Guards and Enclosures	Provided			
9.5.2	**Coupling details (gear box and wheels)**	**Cross Travel**	**Long Travel**		
	Type	Flexible geared type			
	Guards and Enclosures	Provided			
9.5.3	**Coupling details (gear box and rope drum)**	**Main Hoist**	**Aux. Hoist**		
	Type	Flexible built in gear coupling			
	Guards and Enclosures	Provided			
9.5.4	**Shafting (Output)**				
	Factor of Safety	As per IS : 3177-1999			
	Arrangement of Lubrication	Grease cups/ Nipples			
	Type of Lubricant	Grease			
9.6	**Gear box details**				
A.0	**Hoist Motions**	MH	MH Micro	AH	AH micro
	Type of mounting of gear box	Horizontal / Vertical			
	Classification	Suitable for M5 duty			
	Type of gears	Helical / Spur	NA	Helical / Spur	NA

	Type of lubrication (grease / splash / pump lubrication)	Splash Lubrication			
	Difference in Gear and pinion hardness	Min 20 BHN			
	Materials (gear/pinions)	Main Gears En 9/ 55C8/ IS2707 Gr. 1 or 2 Pinions En 19/EN 24. Hardness conforming to IS: 3177			
	Casing	Fabricated Fe 410w IS: 2062 & stress relieved			
B.0	**Travel Motions**	CT	CT micro	LT	LT micro
	Classification	M5 duty			
	Type of gears	Helical/Spur	NA	Helical/Spur	NA
	Type of lubrication (grease / splash / pump lubrication)	Splash Lubrication			
	Difference in Gear and pinion hardness	Min 20 BHN			
	Materials (gear / pinions)	Main Gears En 9/ 55C8/ IS2707 Gr. 1 or 2 Pinions En 19/EN 24. Hardness conforming to IS: 3177			
	Casings	Fabricated Fe 410w IS: 2062 & stress relieved			
9.7	**Wheels details**	**Cross travel**		**Long travel**	
	Material	C 55 Mn 75 / EN9			
	Hardness	300 – 350 BHN			
	Type	Double flanged			
	Numbers	4		8	
	Specification conforming to	IS: 3177-1999			
	Arrangement of lubrication	Grease			
.8	**Lifting hooks**	**MH**		**AH**	
	Type	Ramshorn (with swiveling arrangement and locking device)		‘C’ type / point(with swiveling arrangement and locking device)	

	Material	Class 2 IS: 1875			
	Standard conforming to	IS: 5749		IS: 15560	
9.9	**Brakes**				
A.0	**Hoist Motions**	**MH**	MH micro	**AH**	AH micro
	Type of brake	AC Electro-Hydraulic Thruster operated			
	Number provided	2	NA	2	NA
	Braking capacity	150%	NA	150%	NA
B.0	**Travel Motions**	**CT**	**CT micro**	**LT**	**LT micro**
	Type of brake	AC Electro-Hydraulic Thruster operated			
	Number provided per motor	2	NA	2	NA
	Braking capacity	125%	NA	125%	NA
9.10	**Bearings**				
	Type	Antifriction ball / roller bearings			
	Method of lubrication	Grease lubrication			
	Bearing life	10,000 working hours.			
9.11	**Bridge girder**				
	Type & Quantity	Box type – 2 nos, Material: IS 2062 Gr. A / B			
	Vertical Deflection	Span / 900			
	Type of connection to end carriage	By fitted bolts			
9.12	**Rails**				
	Type / section	CR-100 (for long travel), & CR 80 (min.) (for cross travel) Rails sections as per IS: 3443 Grade 50 C 12. Joint to be butt-welded by thermit welding & fusion welding or by end clamping arrangement.			
	Standard conforming to	IS: 3443			
	Material	Rail Steel			
10.0	**Motors**	Suitable for ambient temperature of 50^0C			
10.1	**Hoist Motions**	**MH**	**MH micro**	**AH**	**AH micro**

	Type	SC, suitable for Inverter duty	NA	SC, suitable for Inverter duty	NA
	Enclosure	TEFC	NA	TEFC	NA
	Numbers furnished	1	NA	1	NA
	Voltage, phase and frequency	415V ± 10%, 3 Ph, 50 Hz (± 5%) Combined voltage & frequency variation = 10% absolute			
	Class of protection	IP – 55			
	Rated capacity (KW)	Motor ratings shall be calculated keeping margin of at least 25% over the maximum power requirement. Further, the hoist motors shall be rated to lift 120% of the design load on the hook at the rated speed			
	Rating	S4, 60 % CDF			
	Class of insulation	Class 'F' for sq. cage motors with temp rise limited to that of class B			
	Number of starts/ hour	300 starts / hr			
10.2	**Travel Motions**	**CT**	**CT micro**	**LT**	**LT micro**
	Type	SC, suitable for Inverter duty	NA	SC, suitable for Inverter duty	NA
	Enclosure	TEFC	NA	TEFC	NA
	Numbers furnished	1	NA	2	NA
	Voltage, phase and frequency	415V ± 10%, 3 Ph, 50 Hz (± 5%) Combined voltage & frequency variation = 10% absolute			
	Class of protection	IP – 55			
	Rated capacity (KW)	Motor ratings shall be calculated keeping margin of at least 25% over the maximum power requirement. Further, the hoist motors shall be rated to lift 120% of the design load on the hook at the rated speed			
	Rating	S4, 60 % CDF			
	Class of insulation	Class 'F' for sq. cage motors with temp rise limited to that of class B			
	Number of starts/ hour	300 starts / hr			
	Space heater requirement	For motors above 30 KW rating			
11.0	**Limit switches**	**Main hoist**	**Aux. Hoist**	**Cross Travel**	**Long Travel**

	Type	Rotary gear + Gravity	Rotary gear + Gravity	Lever type	Lever type
	Number provided	1 + 1	1 + 1	2	2
	Control voltage	110 V			
12.0	**Power conductors (DSL)**				
	Type	LT: PVC shrouded conductor bus bar. CT : Flexible trailing cable mounting on retracting support (Festoon type) ERP insulated Cu conductor as per IS :9968			
		(one LED type lamp will be provided at one end of the DSL for power indication)			
	Length	Suitable for entire bay length			
13.0	**Control panel**				
	Material	Rolled sheet steel 2mm size			
	Numbers and location	One each for MH, AH, CT and LT located on bridge platform			
	Degree of Protection	IP 54			
14.0	**Master Controllers**	**Main Hoist**	**Aux Hoist**	**Cross Travel**	**Long Travel**
	Number of steps	5	5	4	4
	Voltage & current rating	10 A, 415 V			
	Location	In cabin			
15.0	**Cable**	**Power**		**Control**	
	Material	Al / Copper		Copper	
	Size	Min. 2.5 mm2 for Cu. Min.16 mm2 for Al.		Min. 2.5 mm2 (Stranded Min. 7 stands)	
	Type	PVC insulated.			
	Voltage grade	1100 V			
	Voltage drop	Cable from main changeover switch to motor terminal shall be so sized that the voltage drop does not exceed 3% of rated voltage.			
16.0	**Contactors**	AC 4 duty for reversing application. AC 3 duty for non reversing application			

17.0	**Switches**	AC 23 for motor application, AC 22 for other application.	
18.0	**Fuses**	HRC	
19.0	**Overload relay**	Temperature compensated bi metallic with single phasing preventor.	
20.0	**Fire Extinguisher**	Four (4) nos.	
	Type and size	4.5 kg , CO_2 type	
	Location	One in cabin and Three on bridge	
21.0	**Power Supply**	Two (2) nos. 415 V, 3 phase, 4 wire supply at operating floor near 'A' row column at centre of bay length with change over switch.	
22.0	**Transformer**	2 X 100 %	
	Voltage Rating	Control 415/110V, Lighting 415/0-24-240V	
23.0	**Illumination**		
	In cabin	40W florescent fixture + Bulk head fitting with 60W incandescent lamp – 1 each, 2nos. 24V – 5A – 3 pin industrial socket	
	Over Bridge	4 nos 60 W Bulk-head fittings with incandescent lamps and 4nos. 24V – 5A – 3 pin industrial socket	
	Under bridge	4 nos. 250 W HPSV lamps	
	For inspection of crane components	One (1) portable 40 W hand lamp with min. half span length flexible cable for inspection of crane components	
24.0	**Ventilation**	One (1) no. Electric fan in cabin	
25.0	**Buffer**	Cross Travel	Long Travel
	Number	4	4
	Type	Rubber / Spring Loaded Type. To be designed to bring the loaded crane to rest from speed of 50 % of the rated speed.	
26.0	**Type of platform required on the bridge.**	Chequered plate platform 6 mm thick as per IS :3502	
	Position of access point	From cabin	
	Emergency escape	Rung ladder at ends	
	Type of access platform to cabin	By Rung ladder	
	Length	Full span length	

	Provided on both sides	Yes
27.0	**Operators Cabin**	
	Type of construction	Open type
	Area and minimum clear height	2500x1850 mm with a head room of 2000 mm
	Operator's seat	Revolving type
	Warning gong	Foot operated Brass gong suspended outside the cabin and operated from inside. Suitable for 240 V AC of noise level 95 dBA at 3.5 m
	Position of controllers	In front/ side of operator's chair
29.0	**Type of control for Hoists/ CT/LT operation**	Through VVVF drive
30.0	**Additional Operation**	Through radio remote control
	Type	Microprocessor based digital technology
	Communication	Communicate up to 100 m approx.
	Operation	Through joystick
	Local unit	One local unit with selector switch for operation either from cabin or radio remote unit or Pendant

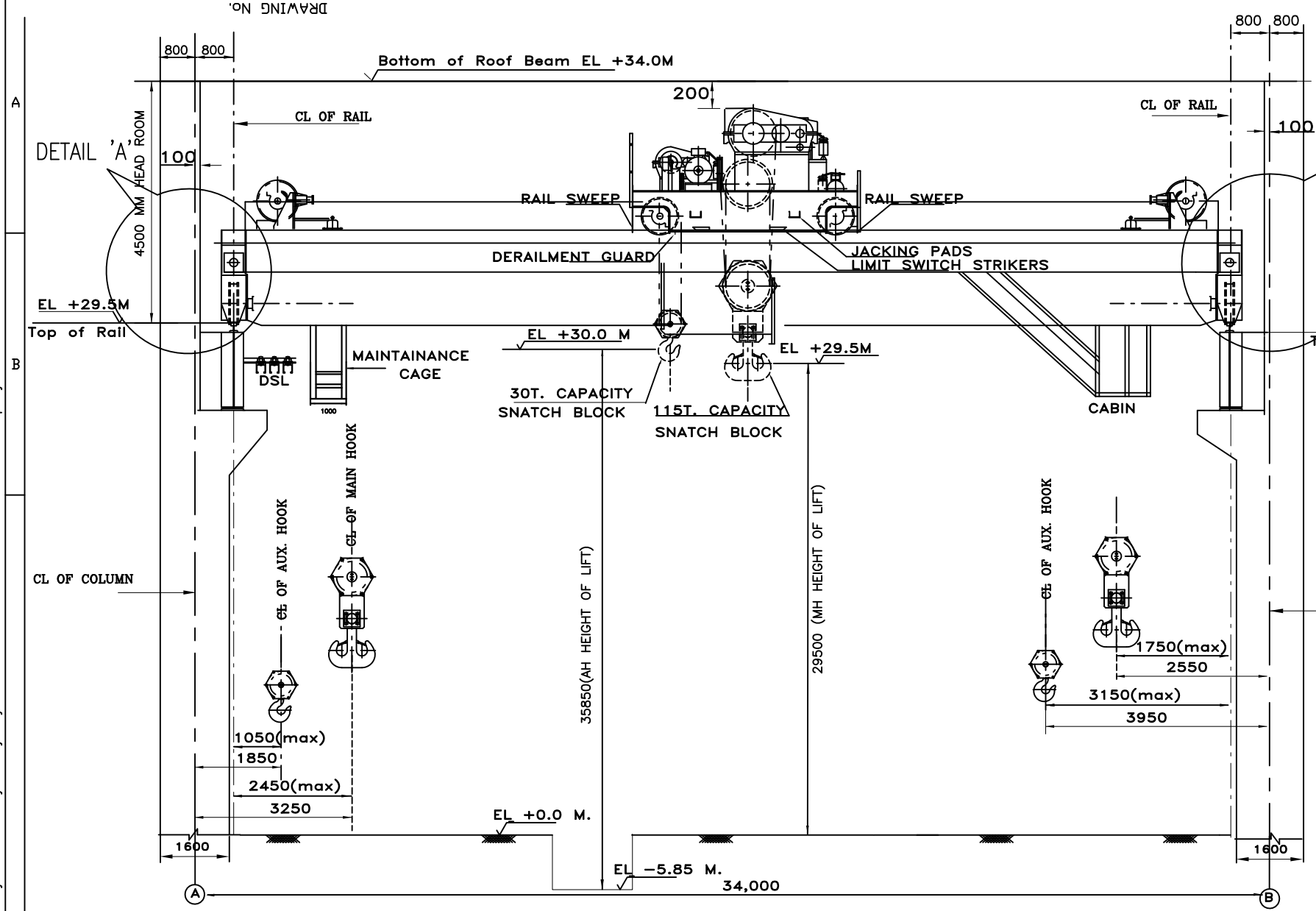
	SPECIFIC CONFIRMATION / COMMENTS REQUIRED FROM BIDDER	SPECIFICATION: PE-TS-373-501-A001
	TITLE: DOUBLE GIRDER EOT CRANE	REVISION: 0
	PROJECT: 2x500 MW Sagardighi TPS,	DATE: 16.06.2011 No. of SHEETS: 2
S.N.	DESCRIPTION	REPLY / COMMENTS BY BIDDER
1.00	MECHANICAL	
1.01	Bidder to confirm the adherence of technical Data sheet (110/25 T Capacity D/G EOT Crane) & Customer specific requirement (Annexure-III) As in Project Specific Technical Specification (PE-TS-373-501-A001) & all other requiremements as per Standarad Specification (. PE-TS-STD-501-A001 (Rev03)),Bidder to confirm the same. (in case of any deviation bidder to specify the same in deviation format, deviation submitted eslewhere will not be considered for evaluation)	CONFIRMED / NOT CONFIRMED
1.02	Bidder to confirm that there is no deviation from the Crane Clearance Diagram(No. PE-DG-373-501-A001) provided the Technical Specification no. PE-TS-373-501-A001, **Bidder to specifically note that in no case any deviation from the Crane Clearance diagram given by BHEL shall be accepted. Bidder to confirm the same.**	CONFIRMED / NOT CONFIRMED
1.03	Bidder to confirm that there is no deviation from the makes of various sub vendors items as given in annexure-I “Makes of Sub-vendors Items” , volume II-B, section-C of Standard Technical Specification . PE-TS-STD-501-A001 (Rev03) **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
1.04	The material offered is equal or better in grade than specified. **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
1.05	Bush as a antifriction bearing shall not be used. **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
1.06	Bidder to specifically note that there is specific requirement of the **painting** for this particular project. **Bidder to confirm** the compliance to the attached Painting specification (in Project Specific technical specification no. PE-TS-373-501-A001) .	CONFIRMED / NOT CONFIRMED

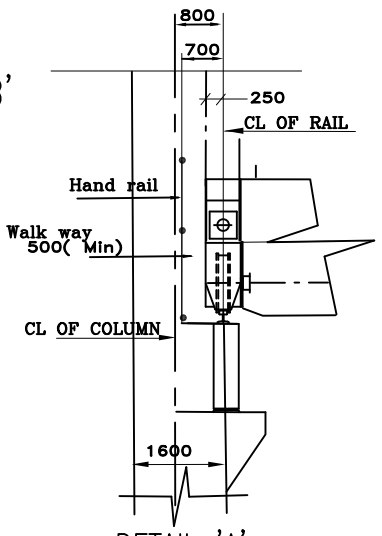
1.07	Bidder to confirm that in case of award of order, **Hook drawing** shall be submitted to BHEL within one week of receiving the LOI by bidder. **Bidder to confirm**	CONFIRMED / NOT CONFIRMED
1.08	Bidder to confirm that in case of award of order, Motor Sizing calculations shall be submitted within 15 days time of receiving the LOI by the bidder. **Bidder to confirm the same.**	CONFIRMED / NOT CONFIRMED
1.09	Bidder to confirm that there should not be Price implication for the change in span for ±500mm and change in the lift for ±1000mm	CONFIRMED / NOT CONFIRMED
1.10	Bidder to confirm that any erection & commissioning spares required for the successful commissioning of the system is included in the main scope of supply.	CONFIRMED / NOT CONFIRMED
1.11	Bidder to note that the design calculation criteria for END STOPPERS for CRANES is to be submitted by the vendor, & end stoppers are to be supplied as per the approved design Caculation criteria of stoppers.	CONFIRMED / NOT CONFIRMED
2.00	**ELECTRICALS**	
2.01	**CABLES**	
a	All CONTROL AND POWER cables shall be as per BHEL specification. **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
b	Cable required between isolating switch / change over switch and DSL included in the scope. **Bidder to confirm the same.**	CONFIRMED / NOT CONFIRMED
2.02	**MOTORS**	
a	Class of insulation of Sq. cage motors shall be "F" and the temperature rise to limited to class "B". **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
b	Motor size shall be subjected to the approval of motor calculation. **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
c	The QPs related to electrical items shall be approved during detailed engineering. However , the monimum requirements indicated in the following QP's shall be complied. **Bidder shall confirm the compliance**	CONFIRMED / NOT CONFIRMED
d	Bidder to confirm that there is no technical deviation on "Electrical portion of Technical specification" and "Data sheet of Electrical portion". **Bidder to confirm the same.**	CONFIRMED / NOT CONFIRMED

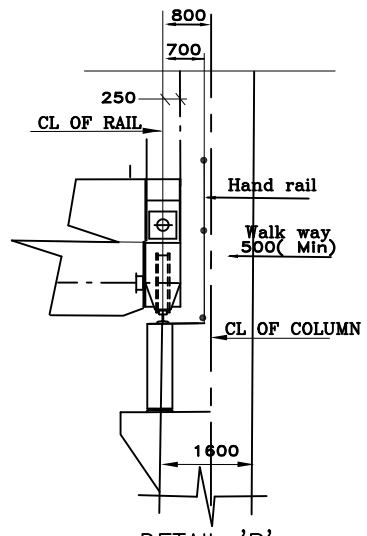
Fold-2 | ALL DIMENSIONS ARE IN MM | FIRST ANGLE PROJECTION | Fold-1

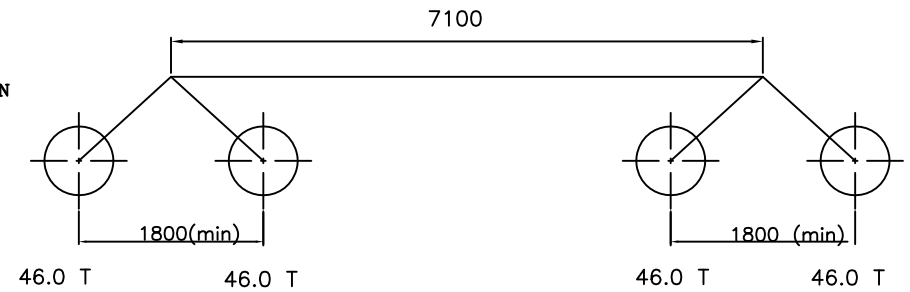
DRAWING No. PE-DG-373-501-A001

CUSTOMER'S DRAWING No.









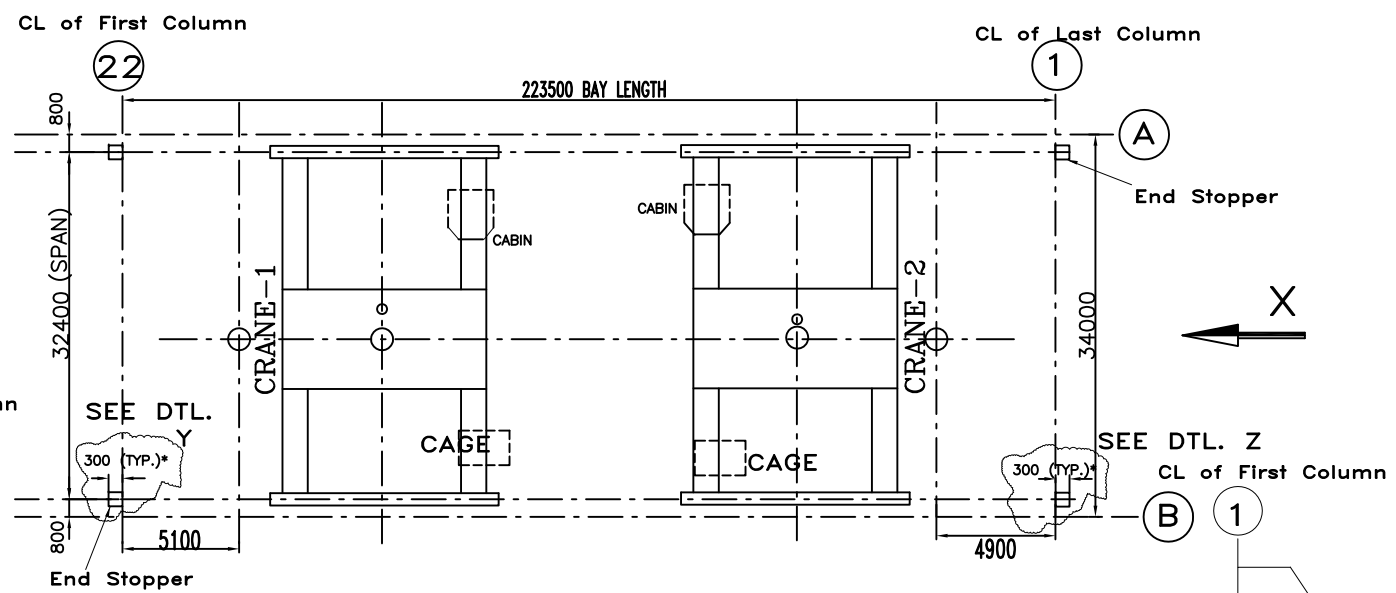
LT WHEEL LOAD DIAGRAM WITHOUT IMPACT

WEIGHT OF HEAVIEST COMPONENT TO BE LIFTED (LP ROTOR) = 100.0 T

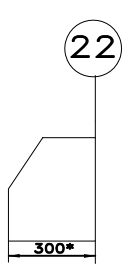
NOTES

1) DRAWING IS NOT AS PER THE SCALE.
2) ALL DIMENSIONS ARE IN MM & ELEVATIONS IN METRES.
3) GROUND FLOOR IS CONSIDERED AS EL +0.0 M. IN CASE GROUND FLOOR IS DIFFERENT FROM EL +0.0 M THE ELEVATION OF CENTRELINE OF HOOK AND BOTTOM OF ROOF/BEAM SHALL CHANGE ACCORDINGLY.
4) DISTANCE B/W CENTRE LINE OF RAIL & CENTRE LINE OF COLUMN CONSIDERED AS 850MM ON BOTH ROWS & OFFSET ABOVE THE BRACKET CONSIDERED AS 100MM.
5) END STOPPER WIDTH INDICATED AS 300MM IS MINIMUM, THE EXACT DIMENSION SHALL BE DECIDED DURING DETAIL ENGINEERING, AFTER CONSIDERATION OF DESIGN CALCULATION OF STOPPER AS PER REQUIREMENT.

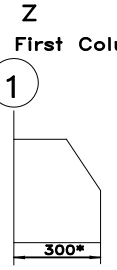
VIEW-X



KEY PLAN



DETAIL 'Y'



DETAIL 'Z'

JOB NO. 373				
STATUS CONTRACT				
DRG./REF. NO. (INTERNAL)				
PRINT SCALE 0 2 4 6 8 10 20 30 40 50				
REV.	DATE	ALTD	CHD	APPD

THE WEST BENGAL POWER DEVELOPMENT CORPORATION LTD.
SAGARDIGHI THERMAL POWER PROJECT PHASE-2
2 x 500 MW UNIT 3 & 4

BHARAT HEAVY ELECTRICALS LTD
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NEW DELHI

DEPT CODE		NAME	SIGN	DATE
	DRN	AK		17/06/11
	DESN	AK		17/06/11
	CHD	GBC		17/06/11
	APPD	GBC		17/06/11

SUB-CONTRACTOR

TITLE
CRANE CLEARANCE DIAGRAM OF TG HALL
110/ 25 T (DOUBLE GIRDER) E.O.T. CRANE (2 nos)

DEPT.	SCALE	DRAWING NO.
SIGN		PE-DG-373-501-A001
DATE		SHEET 1 OF 1 REV. 00

SIZE-A3

COMPUTER FILE NAME : TAL5

Fold-3 | Fold-2

DCPL-K8A07

VOLUME : IIJ

SECTION-II

MISCELLANEOUS CRANES

1.00.00 GENERAL INFORMATION

This section covers the Electric Overhead Traveling (EOT) Cranes which will be required for handling various p ower plant equipment for erection and maintenance purposes. An indicative list of su ch cranes has been provided in Annexure-I. Apart from these locations, E.O.T cranes may also be provided to other locat ions which the Bidder feels ne cessary subject to approval of Consultant/Owner.

2.00.00 CODES AND STANDARDS

The design, manufacture and test ing of the crane shall con form to the latest editions of the following codes and standards

2.01.00 IS : 807 - Code of Practice for De sign, Manufacture, Erection and Te sting (Structural Portion) of Cranes and Hoists.

2.02.00 IS : 3177 - Code of Practice for Design of Overhead Traveling Cranes and Gantry Cranes other than Steel Works Cranes.

2.03.00 IS : 1835 - Round Steel Wires for Ropes.

2.04.00 IS : 2266 - Steel Wire Ropes for General Engineering Purposes.

2.05.00 IS : 3443 - Crane Rail Sections.

2.06.00 IS : 15560 - Point Hook with Shank up to 160 tones - Specification.

2.07.00 IS : 5749 - Forged Ramshorn Hooks.

2.08.00 IS : 816 - Code of Practice f or Use of Metal Arc Weldin g for Gen eral Construction in Mild Steel.

2.09.00 IS : 1323 - Code of Practice for Oxy-Acetylene Welding for Structural Work in Mild Steel.

2.10.00 IS : 9595 - Recommendations for metal arc welding of carbon & carbon - manganese steel.

2.11.00 All electr ical insta llation work shall comply with the provisions of In dian Electricity Act and Indian Electricity Rules as amended upto date.

2.12.00 ANSI-830.2.0 - Safety codes for overhead and Gantry Cranes.

In case of any contradiction between the above mentioned codes and standards (item 2.01.00 thru' 2.12.00 above) and this technical specification, the later will prevail. However, nothing in this specification shall be construed to relieve the Contractor of his responsibility to comply with what is mentioned against item 2.11.00 above.

3.00.00 SCOPE OF WORK

3.01.00 Scope of work includes supply of the following :

3.01.01 The required no. of E.O.T cranes as indicated in Annexure-I having duty and service conditions as specified hereinafter along with all accessories.

3.01.02 Runway rails for entire runway length along with rail clamps, all inserts, insert plates, anchor bolts, nuts, buffers & stops, limit switches etc. as required.

3.01.03 Runway conductors for the entire runway length complete with all insulators, supports, support brackets, fixing clamps, bolts, nuts etc. as specified and as required to complete the installation. Power supply cabling including isolating switch complete along with electrical items, attachments and accessories as required to feed power to the runway conductor.

3.01.04 All protective devices, anticollision limit switches etc. as required for the crane.

3.01.05 All facilities, accessories and attachments for operation of the TG Hall cranes.

3.01.06 Bridge and trolly current collectors and bridge cross conductors alongwith all wirings etc. for the crane as specified and as required to complete the scope of work.

3.01.07 Crane components shall be provided with lifting lugs, eye-bolts etc. at suitable locations for handling assembling, lifting and placing into position.

4.00.00 SPECIFIC PERFORMANCE REQUIREMENTS

4.01.00 Capacity

4.01.00 Capacity

4.01.01 The safe working load (X) for each of the turbine hall EOT crane shall be computed as

X = 1.10 x a

where a = Single heaviest equipment expected to be handled excluding Generator Stator, & minimum capacity of auxiliary hook is 25 Tonnes(minimum).

4.02.00 Highest Position

The highest position reached by the lifting hooks should be such that during operation, the minimum vertical critical clearance between bottom of the equipment being handled and the top of any permanent structure or equipment in the operating area should be at least one metre.

4.03.00 Lowest Position

4.03.01 The lifting hooks of the turbine hall cranes should reach upto the ground level (0 m). The auxiliary hooks should reach upto the condenser pit level.

4.03.02 In case of all other E.O.T cranes, the lifting hooks should reach upto the floor of its operating area or sump pits as necessary.

4.04.00 Horizontal clearance

4.04.01 The lifting hooks in vertical position should reach at least upto 5m from the end stopper in case of turbine hall cranes and upto 2.5m in case of all other cranes.

4.04.02 Either the main or the auxiliary hook in vertical position should reach at least upto 1.5 m from the runway rails in case of turbine hall cranes and upto 1.0 m for all other cranes.

4.05.00 If safe and reliable handling necessitates more operating space for the E.O.T. cranes, the same shall be provided.

5.00.00 DESIGN & CONSTRUCTION

5.01.00 General

5.01.01 In the design of components on the basis of strength, factor of safety shall not be less than five (5) based on ultimate strength. Impact, fatigue, wear and stress concentration factors shall be taken into account, wherever applicable. Mechanism class shall be as indicated in the Data Specification Sheet.

5.01.02 The crane shall be rigid in construction and all movements shall be smooth and non-jerky.

5.01.03 Drives shall be designed with adequate margin to give best performance and efficiency. Safety arrangements shall be incorporated to prevent damage to motors on account of mechanical overload and electrical faults and to gearing, shafts, etc. due to over-stressing and other detrimental conditions.

5.01.04 All materials shall be of tested quality and shall conform to the specification requirements and standards mentioned and shall be new and first class in all respects.

5.01.05 Castings and forgings shall be of tested quality and shall conform to their respective material specifications and shall be free from flaws and objectionable imperfections, machined true and in a workman like manner.

5.01.06 No wood or other combustible material shall be used unless specifically approved by the Owner/Consultant.

5.01.07 Proposals for repair or any similar operations involving plugging, welding, boring or addition of metal to the original castings or forgings shall be submitted to the Purchaser and his approval must be obtained before any such work is carried out. Drawing showing details and location of such repairs shall be submitted to the Purchaser.

5.01.08 All fabrication by welding shall be carried out by qualified and certified welders .

5.01.09 Design shall provide for easy maintenance of all parts, particularly the wheel bearings on end-trucks.

5.01.10 Temperature Effects

Where any portion of the structure is not free to expand or contract under variation of temperature, allowance shall be kept for stress resulting from these conditions; the co-efficient of expansion for each degree centrigrade variation of temperature above and below normal being taken as 0.000012 for mild steel. The maximum range of variation of temperature shall be as given in the Lead Specification. Clause 8 of Section II of IS : 800-1962 Code of practice for use of structural steel in General Building construction - shall also apply.

5.01.11 Maximum use shall be made of shop fabricated sub-assemblies.

5.01.12 Alternative design to those prescribed in specifications will be considered only if found technically suitable and acceptable to the Owner in the light of requirements and accompanied by substantial reduction in cost.

5.01.13 Material of Construction

The material of construction of the major components of the crane shall be as indicated in the Data Specification Sheet. Manufacturers are however free to use alternative material, which are superior for the intended service. But in all cases they are required to obtain prior concurrence of Owner after furnishing chemical and physical properties of the offered material and any other information that may be asked for by the Purchaser.

5.01.14 Load Indication

The crane bridge shall have permanent inscription in English on each side, readily legible from operating floor, stating manufacturer's name, serial no., the year of manufacture and the safe working load.

5.02.00 Structural Design Consideration

5.02.01 Minimum thickness of metal

For load carrying members the component plates, bars, angles and other rolled sections shall be minimum 8 mm thick. For tubes having both ends sealed the minimum thickness shall be 4.9 mm (6 SWG). For unsealed tubes the minimum thickness shall be 8 mm. The chequered plates for platforms shall be minimum 6 mm thick over plain.

5.02.02 Accessibility for maintenance

All structural parts shall be designed so that they are accessible for periodic cleaning, brushing and painting. All rivets/bolts shall also be accessible for periodic checking.

5.02.03 Ruling dimensions and ratio

a) For compression members, the slenderness ratio shall not exceed 120. In case of other load carrying members and subsidiary members the slenderness ratio shall not exceed 180.

b) For girders, the following values of maximum span to depth ratio shall be governing :

Plate girders : Span/depth = 18
Lattice girders : Span/depth = 12

5.02.04 Connections

a) Unless otherwise specified, only rivetted or welded joints shall be used.

b) Where welding or riveting is not practicable, turned and fitted bolts shall be used, preferably as per IS-1364 and IS-1367.

c) Minimum number of rivets or turned and fitted bolts in a connection shall not be less than two.

d) Black bolts shall not be used in main structures and high tensile bolts shall not be used unless approved by the Owner. Bolts shall preferably be not used in tension.

e) Where bolts pass through sections having tapered flanges, tapered flats shall be welded to inside of the flanges. Tapered washers shall not be used.

f) Transverse fillet welds on load carrying members shall be avoided. If side fillets are used in end connections, the length of each side fillet should not be less than the edge distance between the fillets.

g) Butt welds on stru ctural members under t ensile stress shall be checked by Radiographic examina tion as and when directed by the Owner/Consultant.

h) Splices shall be designe d to resist o ne and half times the fo rces and moments to which it is subjected, b ut in no case it shall be less than 2/3rd of th e effective strength of the material spliced except that splices in t he webs of the plate girders shall be design ed for full strength of the web in s hear as well as bending. For splicin g tension members, the net section of the splice plate shall be ten percent more than that of the materi al spliced. Splices shall be proportioned and arranged, so that the g ravity axis of the splices are in line with the gravity axis of the member to avoid eccentricity.

5.02.05 Deflections and Camber

a) The total m aximum vertical def lection of the g irders for th e live load plus trolley and not including impact or dead load of the girder shall not exceed limit of Span/900.

b) The girders shall be ca mbered by an amount equal to the maxi mum deflection due to dead load plus one half the live load and trolley.

5.03.00 Bridge Girder and End Carriage

5.03.01 The crane shall have single girder or double girder as required.

5.03.02 The bridge girder shall be box sect ion type or braced I be am type as per standard de sign of the manufacturer. The exterior surface shall be smooth and as free from projections etc. as possible to minimise dust collection on it.

5.03.03 Single girde r cranes sh all be provided with su itable truss f or supportin g the bridge drive machinery and motor.

5.03.04 The crane b ridge shall b e carried on end trucks of suitable design. Each end truck shall be built up fr om steel pla tes welded t ogether to f orm a close d box section with opening at each end to receive the wheels. Welded to the trucks shall be ste el sect ions t o form bearings for th e wheel axles and the d riving shaft. End trucks sha ll be provided with rail sweep and bumper. They shall also be provided with suitable jackin g pads for maintenance of the whe el and bearings. The location of the jacking pads shall be su ch that it will not interfere with the maintenance of the wheels and its bearing.

5.03.05 Driving wheels sha ll be of the dou ble flange and taper tre ad type and shall be ground to e qual diameter in pair s. Wheel axles may be either of the stationary or rotating type as per standard of the manuf acturer. If stationary type, they shall be pre vented from turning in t he truck by means of a key plate fitt ing into a slot in the end of the axle and if rotating type, wheels shall be keyed to them.

5.03.06 Where more than two bridge wheels are used per end truck, the end truck shall be split into two sections, each carrying one bridge independent of other. Two sections of the end truck shall be joined by suitable joining device that will ensure uniform wheel loading. Steel pads shall be welded on the top of end trucks where the girder rests and shall be machined to receive the girder ends.

5.03.07 Trolley travel rail ends shall be curved upwards to stop the trolley smoothly and prevent it from leaving the rails in case of over travel at its maximum speed.

5.03.08 End trucks shall be equipped with spring/rubber buffers and rail sweep for bridge travel. The rail sweep shall be such that it can push away any object that may fall on the runway. The buffers shall be of substantial design and suitable for engaging the stops at the end of runway.

5.03.09 Breathing holes shall be provided in completely enclosed welded box type girders. Drain holes shall be provided in all places where water or oil is likely to collect. Where practicable, means of access shall be provided for inside inspection of completely enclosed box girders.

5.03.10 In bridge girder strength calculations, the trolley rails and chequered plates shall not be considered as load carrying members.

5.04.00 Trolley Frame

5.04.01 The trolley frame shall be built up from heavy steel plates, angles and channels adequately braced to resist vertical, lateral and torsional strains, welded to form a rigid one piece frame. Alternatively, it may be of cast steel construction.

On bottom of trolley frame, on each side shall be a double spring bumper to enagage stops at each end of the bridge.

5.04.02 Equaliser sheaves shall be mounted on the trolley frame in such a manner that deflection resulting from the force on the sheaves are not directly transmitted to the hoisting mechanism.

5.04.03 Sheaves shall be so arranged on the trolley that rope reeving arrangement resulting therefrom will ensure a lifting of the load in almost a vertical line with minimum of swing or side-movement.

5.05.00 Platforms and Ladders

5.05.01 Safe means of access shall be provided to the operator's cab and to every place where any person engaged in the examination or maintenance of the crane has to work. Adequate handholds and footholds shall be provided as necessary.

5.05.02 One metre high double tier handrail and suitable toe-boards shall be provided along the entire length of platform (on the bridge), which shall not be less than 750 mm wide.

5.05.03 Every platforms shall be provided with steel chequered plate top and be securely fenced with one metre high double tier hand rails and toe boards. Platforms shall be of sufficient width to enable normal maintenance work to be undertaken safely.

5.05.04 In case lattice rivetted construction is offered for the bridge girder, full length chequered plate platform with adequate headroom shall also be provided at bottom chord level for periodic checking of all rivets/bolts and other items.

5.05.05 Access to operator's cabin from bridge girder platform shall be by staircase having adequate width and proper sloping.

5.06.00 Operation

The crane shall be operated either from cabin in the crane bridge or from a pendant control station as specified in Data Specification Sheet.

5.06.01 Operator's Cabin

a) The operator's cabin shall be open type, suitable for indoor service and complete with light, fan and seat. The cabin shall be located on one end of the crane bridge and under one of the bridge girders, so that it is offset to one side. The cabin shall be provided with guarding hand rails and the floor shall be covered with electric insulating carpet. A clear headroom of 2000 mm shall be ensured within the cabin.

b) A foot operated type warning gong shall be provided within the cabin. The cabin shall be of ample size to contain controllers, protective pannel, main isolating switch and other accessories required for operating the crane. A ten (10) lbs. capacity portable CO_2 fire extinguisher shall be provided in the cabin.

c) Provision shall be there for emergency exit of the Crane Operator at three convenient positions in case of power failure.

5.06.02 Pendant Station

a) The pendant station shall locate the push buttons for controlling the various motions of the crane and shall be hung from the crane trolley to a height of approximately 1 metre above the operating floor.

b) With pendant operation, foot operated bridge travel brake and the drum controllers need not be provided.

5.07.00 Repair Cage

5.07.01 A repair cage shall be provided on the inside of the end carriage for attending the main current collectors. In case, the trolley current collectors are located below trolley rail level on the inside webs of the bridge girders, guards shall be provided on the trolley to prevent the hoisting ropes from coming in contact with conductors as well as a repair cage shall be provided on the trolley to attend these conductors.

5.07.02 Repair cages shall also be provided at the corners of the crane, if required, to facilitate removal and replacement of long travel wheels.

5.07.03 The repair cages shall be adequately sized, guarded for safety and correctly located for the intended service. Suitable access to the cages shall be provided.

5.08.00 Lifting Hook Block Assembly

The lifting hook block assembly shall be ramshorn type or approved equal for capacity greater than 40 Tonnes and point hook with shank for capacity below 40 Tonnes and shall be of steel construction. Each hook shall be supported on ball or roller thrust bearing and shall rotate freely on its bearings.

The sheaves of the hook block shall be encased in an oil tight casing permitting generous lubrication of wire ropes and sheaves and also preventing accidental tapping of hands.

All sharp edges on the hooks shall be eliminated to prevent damage to the sling ropes. The hooks shall conform to the requirements of IS: 3177.

5.09.00 **Gearing**

5.09.01 Gears in the speed reducer unit for bridge drive and also all hoists and trolley drive gearing shall be enclosed in substantial housing and shall operate in oil bath. The oil shall have additives of approved quality and shall be of approved viscosity at standard temperature (say 60ºC). The housing shall be of sufficient design not to permit a temperature in excess of 90ºC for the oil bath and shall be adequately supported and readily removable without disturbing the gear assembly.

5.09.02 Gears shall be of cast or forged steel and pinions shall be forged steel and shall be machine cut. Gear and pinion teeth shall be treated for resistance to wear.

5.09.03 Gears shall have tooth form and modules as recommended in IS-3 681 and they shall be adequately designed to stand shock load and vibration and shall not be excessively noisy in operation. The ratings of gears shall be established as per IS : 4460.

5.09.04 Spur and helical gears only shall be used for reduction gearing.

5.09.05 Mounting of the gears shall be such that axial thrust on the bearing is minimum. Centre distance of the connecting shafts shall be as close as possible to the theoretical value. Shafts shall be designed to keep their deflections within permissible limits.

5.10.00 Bearing

5.10.01 The type of bearings for various parts shall be as per IS-3177 and standard of manufacturer.

5.10.02 Provision shall be made for service lubrication of all bearings. Bearing enclosures shall be designed as far as practicable to exclude dirt and prevent leakage of oil or grease. Arrangement for centralised lubrication of bearings shall be tried to the maximum extent possible and a detailed scheme for the same shall be furnished alongwith the tender.

5.10.03 Suitable drip pans shall be provided as required to collect oil and grease which may drop from operating parts. All drip pans shall be accessible for draining and cleaning.

5.10.04 All bearings of the gearing shall be antifriction type. Angular contact ball or taper roller bearings shall be used wherever necessary. The bearings shall correctly locate the shafts while allowing for the rmal expansion of the shafts. Bearings shall be enclosed in suitable housing with proper holes and plugs to prevent any ingress of dirt and to permit easy lubrication of the bearings.

5.11.00 Guarding

5.11.01 Guards of an approved design, which will push forward or off the rail track any object placed across it, such as person's foot or arm, shall be attached to each end of the end carriage.

5.11.02 Protection guards to live electrical wirings/conductors shall be provided.

5.11.03 Suitable guards to revolving shafts and coupling, long travel cross shafts and gears, shall be provided.

5.11.04 The sheaves of the hook block fitted with two sheaves or fewer shall be guarded to prevent tapping of a hand between a sheave and the running rope.

5.11.05 Effective means of guiding the wire ropes over the sheaves shall be provided so as to prevent dismounting of rope from the sheave grooves even when a slack rope condition is developed.

5.11.06 All openings in footwalk flooring, for access to bottom chord platform, if any, and to other inspection platforms, shall be provided with covers having suitable locking means to avoid any accidental opening.

5.11.07 All electrical panels, resistance boxes shall have suitable rain/ dust hoods over them to prevent water and building construction material falling on them, as it is apprehended that erection and commissioning of the crane might have to be taken up before completion of the building roof.

5.12.00 Runway Rails

5.12.01 Crane runway rails with bolts and nuts and complete with shims, anchor bolts, inserts and other fixtures for fixing the rails to crane girders shall be under the scope of supply of the present specification.

5.12.02 The length of the rail supplied shall be sufficie nt to cover t he whole of runwa y length. Gap between successive rails shall not exceed 2 mm and end rails shall be provided with stoppers to prevent longitudinal shifting.

5.12.03 The rail section shall be as per IS: 3443.

5.13.00 Trolley Rail

5.13.01 The specification includes the supply of trolley travel rails complete with fixtures for fixing the rails to the body of crane.

5.13.02 The length of the rail supplied shall be adequate for maxi mum permi ssible trolley travel. Gap bet ween successive rails shall not exceed 2 mm an d end rails shall be provided with stoppers to prevent longitudinal shifting.

5.14.00 Rail Joints and Fixing

5.14.01 The rails shall be butt jointed by either thermit welding o r fusion welding process. Th e Contractor shall get h is proposal for edge-preparation of rails, welding pr ocedure a nd sequen ce, approved in ad vance by the Purchaser/Consultant.

5.14.02 The schemes of securing the rails to the gant ry girder/bri dge structure with clamps, bolts and nuts, their alignment etc. shall be subject to the approval of the Purchaser/Consultant.

5.15.00 Tolerances

The limits o f tolerance as spe cified in the Data Specificatio n Sheet sh all be observed.

5.16.00 **Rail End Stops**

Rail end st ops of ade quate desig n shall be provided on both ends of the runway. Th e end stop location a nd arrangement shall be such th at the unavailable length of runway (for crane operation) on any end is a minimum.

5.17.00 **Drive Mechanism**

5.17.01 Equal driving effort sha ll be applied at each drive wheel of bridge and t rolley to prevent one end from travelling faster than the other.

5.17.02 For bridge, the torsional deflection in the cross shaft shall b e limited to safe value as per applicable code.

5.17.03 For bridge drive, the motor shall be located at mid position of the span. If twin motors are used for drive, motors shall be equidistantly located at each wheel end. Suitable interlock shall be provided to prevent single motor operation at any time.

5.17.04 Trolley drive shall be achieved by single motor i n which the motor shall drive a common output shaft through pr oper gearbo x and tractive power shall be transmitted to the geare d wheels by means of pinions moun ted on both ends of the output shaft.

5.17.05 All machineries for the drive unit sha ll be properly aligned. Self-aligning type gear couplings shall b e used between connection shaft s to take care of transverse as well as axial mo vement whe rever necessary. Wherever components of considerable amount of inertia is directly mounted on the high speed shaft(e.g. brake drum, couplings, etc.) they shall be balanced statically to minimise vibration.

5.17.06 Motor rating s shall be calculated ke eping margin of at least 25% over the maximum p ower requirement. Further, the hoist motors shall be rate d to lif t 120% of the design load on the hoo k at the ra ted speed. For other details the clause no. : 5.19.00 below shall be referred to.

5.17.07 Along with the drive mechanisms adequate b rakes shall be provide d as detailed in clause no. : 5.20.00 below. Selection and design of brakes shall be complete responsibility of the manufacturer. Th e brakes sh all be of a ccurate rating to stop each motion within a very sho rt distance and in a safe and smooth manner.

5.18.00 Crane Electricals

5.18.01 The crane(s) shall be furnished complete with all elect rical equip ment, accessories (like drive motors with VVVF Dr ives, conductors, insulators, protective & operatin g devices, cable s, current colle ctors et c.) and cabling/wiring as may be necessary for the efficie nt and safe operation of the crane.

5.18.02 The crane electrica ls shall be designed for satisfactory operation from the available power supply as given in the Data Specification Sheet.

5.18.03 If power supply other than that specified is required, the Contractor shall have to mak e his own arra ngement b y furnishin g all neces sary conversion, rectification and transformation equipment and accessories.

5.18.04 Unless otherwise specified, the crane electricals shall be designed for ambient air temperature of 50 De g. C relative humidity of 100% and site elevation less than 1000 metres above mean sea level.

5.18.05 All electrical equipment, accessorie s and wiring shall have t ropical protection involving special treatment of insulation and metal against fungus, insects and corrosion.

5.18.06 All electrical equipment shall be laid out so that they are readily accessible for inspection and maintenance.

5.18.07 The hoist structures, motor frames & metal comes of all electrical equipment on EOT crane/hoist shall be effectively grounded as per Indian Electricity Rules.

5.18.08 If the pendent control is of metal, it shall be earthed.

5.18.09 All equi pment offe red shall ha ve suitable pro visions for termination and connection of Owne r's power and control cabl e inclusi ve of cable en d bo x, brass co mpression gl ands termi nal lugs an d te rminals. I ncoming switch -fuse shall be provided at each panel for incoming AC/DC power supplies.

5.19.00 Drive Motors

5.19.01 All crane motors shall be totally enclosed, fan cooled type, having class-B stator insulation and class-F rotor insulation fo r slip ring motors & class-B insulation f or squirrel cage motor with te mperature rise limited to class-B operation in all cases.

5.19.02 Motor enclosures shall conform to the degree of protection IP-55.

5.19.03 Motors shall be Squirrel Cage type, designed for crane du ty requirement of frequent starting. Reversing and plugging m otors of single girder E OT crane shall also be squirrel cage type. All motors shall be suitable for VVVF operation.

5.19.04 Motors shall suit the duty class S4, cyclic duration factor 60% and 300 starts per hour. Motor pull out torque shall not be less than 2.75 times rated torque.

5.19.05 The motor shall be capable of operating satisfactorily at full load for 5 minutes without injurious heating with 75% rated voltage at motor terminals.

5.19.06 The motor shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage.

5.19.07 Starting current shall not exceed 6 times full load current for creep speed motor and 2.00 times full load current for slipring motor.

5.19.08 The motor shall be capable of withstanding the stresses imposed if s tarted at 110% rated voltage.

5.19.09 Motor s hall start with ra ted lo ad an d accele rate to full s peed wit h 80 % rated voltage at motor terminals.

5.19.10 The starting torque developed by motor at minimum permissible voltage at start i. e. 80% of rated voltage shall be more than the starting torque requirement of driven equipment by margin of at least 10% throughout the range of starting in order to account for higher starting torque required during service due to wear and tear.

5.19.11 Motor subj ect to re verse ro tation s hall b e d esigned to wi thstand the st resses encountered when st arting wit h non -energised shaft ro tating at 125% rated speed in reverse direction.

5.19.12 The motor shall start s moothly and rapidly and maintain steady operation. The motor characteristic such as speed, starting torque, acceleration time etc. shall be prop erly co-ordin ated with re quirement of dri ven eq uipment. Maximum torque shall not generally be below 200% of full load torque.

5.19.13 Breakaway torque and pullout torque shall be properly co-ordinated with speed torque characteristic of the driven equipment. The torque speed characteristic of motor super imposed thereon, driven equipment torque speed characteristic at 100%, 90%, 80% and 110% of rated voltage shall be furnished to establish capability to start the motor successfully with load connected.

5.19.14 The locked motor withstand time under hot condition at 110% rated voltage shall be more than motor starting time by at least 3.0 seconds for motors upto 20 seconds starting time.

5.19.15 Starting time mentioned above is at minimum permissible voltage of 80% rated voltage.

5.19.16 Hot thermal withstand curve shall have a margin or at least 10% over the full load current of the motor to permit relay setting utilising motor rated capacity.

5.19.17 Each motor more than 30 KW rating shall be provided with space heater, sized to maintain motor internal temperature above dew point when the motor is idle.

5.20.00 Brakes

Selection and design of brakes shall be such as to meet the following requirements :

5.20.01 Service Brake

a) Double-shoe type service brakes shall be provided for each motion of the crane and its hoists. The service brakes shall apply automatically when power supply to the drive motor is cut-off or fails.

b) Service brakes for main hoist motion shall be electro- hydraulic thrustor type, for all double girder cranes either cabin or pendant operated and electro magnetic disc. type for single girder crane; adequately sized to arrest motion and hold at rest any load upto and including test load at any position of the lift.

5.20.02 Hoist Control Braking Means

Hoist motion (both main and auxiliary) shall be provided with a self-contained sturdy braking system, preferably of electro- hydraulic thrustor type, to control the speed of hoisting as well as lowering down to 10% rated speed. The braking system shall be reasonably uniform and effective with all loads (from no-load to full-load) on hooks.

5.21.00 Main Disconnect Switch

5.21.01 Main disconnect switch shall be metal-clad, 3-pole, load-break type in IP-54 enclosure, complete with compression brass glands and lugs to suit Purchaser`s power supply connection.

5.21.02 The switch shall be provided with "Power On" red indication lamp (LED type) and shall be suitably located so that it can be manually operated from the operating floor level.

5.21.03 Power leads shall run from the main disconnect switch to the runway conductors.

5.22.00 Runway Conductors (Down Shop Leads)

5.22.01 The runway conductors shall be four (4) in number for three phase supply and ground.

5.22.02 The runway conductors shall be of M.S. angle sections, liberally sized so as not to exceed current density of 0.42 Amps/sq.mm. However, for small capacity cranes having lower spans i.e. compressor house crane, flexible copper cable will be used.

5.22.03 Sufficient allowance (minimum 20%) for wear and tear shall be provided over the calculated conductor size.

5.22.04 The runway conductors shall be supported on brackets and insulators from the crane girder with sufficient spacing in between the conductors.

5.22.05 The collector system per conductor shall be top-running type having spring loaded cast iron/carbon metallic shoes to maintain adequate contact pressure.

5.23.00 Cross-Conductors on Bridge

5.23.01 Cross conductors on bridge shall be flexible trailing cable system mounted on retracting supports (festoon type).

5.23.02 Alternatively cross conductors of M.S. angles with shoe collectors, similar to the arrangement of runway conductors may be offered.

5.24.00 **Power Distribution Equipment**

5.24.01 From the main collector shoes, wiring shall be extended to two (2) nos., 3-pole, load-break, safety disconnect switches -one at the bridge near the collector and the other in operator's cabin within easy reach.

5.24.02 The safety switches shall be capable of cutting-off the supply to all power driven and associated equipment of the crane but not the auxiliary loads such as fans, lights etc.

5.24.03 From the safety disconnect switches, wiring shall be extended to a protective panel, containing the following as a minimum :

a) One triple pole incoming supply disconnect switch.

b) One triple pole main magnetic contactor with HRC fuse backup, ON-OFF push buttons and RED-GREEN indication lamps (LED type).

c) Motor feede rs, each comprising of triple pole fuse switch unit with thermal o verload (hand reset) relays for short circuit and over load protection in all three phases of the motor.

d) Outgoing feeders with double-pole switch fuse units for auxiliary loads such as control supply, lights, fans, etc. with atleast one spare feeder.

5.25.00 Voltage Drop

5.25.01 All conduct ors and ca bles/wires shall be so sized that t he voltage drop measured between the main discon nect switch and motor terminals sh all not exceed 3% of rated voltage.

5.25.02 The voltage drop shall be computed using the total running current of all crane motors that can operate simultaneously and with rated crane load.

5.26.00 Safety Interlocks

5.26.01 Disconnect Switch

a) The operating handle of the main/ safety disco nnect switch shall be mechanically interlocked with enclosure cover such that the same can not be opened unless the switch is in OFF position.

b) Main/ safety disconnect switch shall have pro vision of pad-locking in OFF position.

5.26.02 Main Contactors

a) The main contactor sh all be electr ically interlo cked so tha t it can not close unle ss all the motor overl oad relays are RESET and all controllers are in OFF position.

b) The main c ontactor sh all be also opened by means of e mergency push buttons and hoist limit switches.

5.27.00 Emergency Switch

Mushroom t ype emerge ncy STOP push button s to open t he main contactor shall be furnished - at least one in operator's cabin and two on bridge platform within easy reach.

5.28.00 Crane Controls

The VVVF Drive control shall be used for control of each motion. The VVVF drive shall b e p rovided with s tep less sp eed co ntrol from 0 to 1 00%. The rating of VVVF shall be decide d considering 250% of fu ll load curre nt of respect ive drive motor.

AMMENDMENT NO. 01 17/08/11

The following amendments with respect to the Project specific Technical Specification for TG Hall Crane - BHEL Document No PE-TS-373-501-A001 Rev 00 shall apply:-

A) Refer technical data sheet of EOT Crane :-

Sl. No. 8.1 Speed for main hoist to be read as : - 1 M/min. (creep speed 10% of main speed (thru' VVVF drives)
Speed for Aux. hoist to be read as : - 3 M/min. (creep speed 10% of main speed (thru' VVVF drives)
Speed for trolley travel (CT) to be read as : - 10 M/min. (creep speed 10% of main speed (thru' VVVF drives)
Speed for longitudinal travel (LT) to be read as : - 15 M/min. (creep speed 10% of main speed (thru' VVVF drives)

B) Refer technical data sheet of EOT Crane :-

Sl. No. 7.0 :-
Operation from to be read as :- operation shall be from Cabin & pendant only. (radio remote control deleted from scope).

C) Refer technical data sheet of EOT Crane :-

Sl. No. 9.9 :-
Number of brakes to be read as :-

MH – 2 Nos. EHT
AH – 2 Nos. EHT
CT - 2 Nos. EHT
LT - 2 Nos. EHT + 2 Nos. HT (
Foot Operated)

D) Refer technical data sheet of EOT Crane :-
Sl. No. 3.0 :-
Crane classification to be read as:- Mechanism Class :-Class 2 as per IS 3177 & IS 807.

Electrical service Class :-Class 4 as per IS 3177.

E) Refer technical data sheet of EOT Crane :-

Refer Sl. No. 15.0

Cable (Power cable):- material of conductor shall be stranded aluminium (Min. 16 MM2)

F) Refer Crane clearance diagram (Drg no. PE- DG-373-501-A001, Rev 00) :-

1.0 Refer Detail ‘A’ & ‘B’ :-

Refer extruded portion of crane parts from centerline of rail :-

The maximum extrusion from centerline of rail towards both sides should not exceed 200 MM, the clear walk way width shall be minimum 500 MM towards both row A & B.

2.0 Refer View -x

- DSL shall be supported from B-Row side.
- Cabin shall be located on A-row side.

ANNEXURE-IV
COLOR CODING PROCEDURE / SCHEME

S.No	ITEM DESCRIPTION	REGION	SURFACE PREP.	PAINTING SCHEME							COLOUR SHADE	REMARKS
				PRIMER	MIN DFT µ	INTERMEDIATE	MIN DFT µ	FINISH	MIN DFT µ	TOTAL DFT		
		As per paint specification										
a	Crane structure	_	_	_	_	_	_	_	_	_	Lemon yellow, shade 356 as per IS-5	
B	Bottom block assembly	__	__	__	__	__	__	__	__	__	Lemon yellow, shade 356 as per IS-5	With black strip
C	Hooks	__	__	__	__	__	__	__	__	__	Lemon yellow, shade 356 as per IS-5	With 100 mm wide black zebra strip
d.	End carriage sweep	__	__	__	__	__	__	__	__	__	Lemon yellow, shade 356 as per IS-5	With black strip
e.	Panels and motors	__	__	__	__	__	__	__	__	__	Steel grey / as req. by purchaser	

ANNEXURE-2

FORMAT FOR NO DEVIATION CERTIFICATE
(To be submitted in the bidder's letter head)

BHARAT HEAVY ELECTRICALS LIMITED,
Power Sector - Eastern Region,
Plot no 9/1, DJ Block, Sector – II, Salt Lake City,
Kolkata – 700 091

Sub	No Deviation Certificate.	
Job	Design, engineering, manufacturing, supply, erection, Testing, commissioning etc including O&M of two nos. 110/25 T Capacity DOUBLE GIRDER TG hall EOT Crane for 2x500 MW units at Sagardighi STPP, Sagardighi, West Bengal.	
Ref	1.0	Tender no PSER:SCT:SDG-M1268:11
	2.0	BHEL's NIT, vide reference no PSER:SCT:SDG-M1268:2574, dated 31-10-11.
	3.0	BHEL's TCN-01, vide reference no PSER:SCT:SDG-M1268:TCN-01, dated 10-11-11.
	4.0	All other pertinent issues till date.

Dear Sirs,

With reference to above, this is to confirm that as per tender conditions, we have visited site before submission of our offer and noted the job content & site conditions etc. We also confirm that we have not changed/ modified the tender documents as appeared in the website/ issued by you and in case of such observance at any stage, it shall be treated as null and void.

We hereby confirm that we have not taken any deviation from tender clauses together with other references as enumerated in the above referred NIT. We hereby confirm our unqualified acceptance to all terms & conditions, unqualified compliance to technical specification, integrity pact (if applicable) and acceptance to reverse auctioning process.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null & void.

We confirm to have submitted offer in accordance with tender instructions and as per aforesaid references.

Thanking you,

Yours faithfully,

(Signature, date & seal of authorized representative of the bidder)